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Material Science

Research in the design, development, manufacture and measurement of synthetic and natural polymers and polymer mixtures, including additives.

- Intrinsically Conductive Polymers** 1
We wet spun polyaniline fiber from N-methylpyrrolidone and from dimethylpropylene urea solvents and developed a database of spin parameters. [C92C8]
- Chaos in Polymer Phase Transitions** 1
We have found inconclusive but encouraging evidence of chaos in the glass transition of polymer monofilaments. [C92N8]
- 'Environmentally Friendly' Fibers** 1
We have spun fibers from naturally occurring cellulose and **chitin**, from polypeptides and from a non-linear optical copolymer of **chitin**. [S93N5]
- Carpet Waste Recycling** 2
We are developing ways to recycle used carpets and carpet industry waste. [G92C3]

Fiber Engineering

Research in the design, development, manufacture and measurement of fibers.

- Cotton Fiber Quality** 3
We are developing procedures for measuring cotton fiber friction and strength and an expert system to select cotton fibers. [A92C1]
- Reclaimed Fiber Mixtures** * 4
We are developing methods to relate properties of reclaimed fiber mixtures to fiber processing performance and to fabric properties. [C93N10]

Yarn Engineering

Research in the design, development, manufacture and measurement of fibrous yarns for textile processes.

- High-Speed Yarn in Textile Processes** 5
The non-linear equations governing motion in over-end unwinding and ring spinning are helping us understand previously unexplained observations. [S92C5]
- Continuously Monitored Data** 5
We are developing procedures to analyze in real time fiber, yarn and process data from opening through spinning. [A92C2]
- Flexible Short Run Yarn & Fabric Formation** 6
For truly 'quick response', the weaving preparation step must be optimized for efficient small lot production. [G92C4]

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Fabric and Fibrous Systems Engineering

Research in the design, development, manufacture and measurement of fibrous structures including textiles, nonwovens, carpet, coated fabric, paper, preforms, etc.

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Wide, Flat Wovens Via Braiding	*	7
We are developing a braiding machine which will produce traditional wide woven fabrics at more than twice the speed of jet looms. [A92C3]		
Material and Machine Interactions		8
We are investigating the structure/property relationships of yarns from various spinning systems with their weaving performance on air-jet looms. [C92C2]		
Textile Structures for Composites		8
We have submitted a patent application for a multiaxial 3-D weaving machine. [S92C12]		
Perceived Appearance Defects in Fabric		9
We can produce a set of "streakiness" standards for the warp knit industry which are far more realistic than what they have now. [S92C9]		
Tomographic Imaging of Nonwovens		9
We are developing tomographic imaging technology to quantify the statistical distribution of fibers in thick nonwovens. [S93N8]		

Dyeing and Finishing Engineering

Research in dyeing, finishing and waste reduction in textile processes.

Real-Time Control of Batch Dyeing		10
We have developed a novel system that allows real-time monitoring of individual dye concentrations in mixtures. [S92C10]		
Low Toxicity Synthetic Dyes	*	11
We have synthesized some patentable iron-complexed azo dyes which are non-mutagenic and have good colorfastness. [S92C2]		
Electrotechnology to Dye and Dry		12
We are assessing infrared, radio frequency and acoustic energy sources to reduce energy to dye and dry textiles. [S92C6]		
Coloration Systems for 'Quick Response'		12
We have achieved surprisingly good dye uniformity in garment dyed men's 100% cotton shirts using reactive dyes. [G92C5]		
Reduced Free Metal in Textile Wastes	*	13
We developed a method to differentiate bound metals from unbound (ionic) metals in dyeing waste water. [A92C4]		
Supercritical Fluid		14
We are researching supercritical CO ₂ , used both as a processing fluid and to extract finishes, etc. from fiber for subsequent analysis. [C92C4]		

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Garment Engineering

Research in the design, development and manufacture of garments.

- Modeling the Apparel Cutting Room** 14
We have developed a model of the cutting room which integrates the cut order planning and marker making processes. [G93N1]
- Comfortable Barrier Textile Systems*** 15
We are developing garment systems that protect the wearer against liquid and airborne hazards, but yet are comfortable and cost effective. [G92C1]

Intelligent Systems Engineering

Research in systems to enable rapid response, including computer modeling, sensor technology, expert systems, customer interactive design and demand-activated, closed-loop production systems.

- Fuzzy Logic Control of Textile Processes** 16
We are developing a hierarchical control system for the slashing operation, which integrates data from previous and subsequent processes. [G92C2]
- On-Line Control of Fabric Properties** 16
We are developing ways to characterize fabric physical properties on-line, especially for apparel manufacturing. [S92C3]
- Interactions of FTAR Firms** 17
Our models of spinning and knitting plants are operational, and those of weaving and dye house are in final debugging. [S92C4]
- CIM Systems in the FTA Industrial Complex** 18
We are creating computer integrated information systems for demand activated manufacturing in the U.S. fiber-textile-apparel complex. [S92C 11]
- Domestic Sourcing of Apparel** 19
We are developing an electronic domestic sourcing model for Alabama apparel producers. [A92C5]

Marketing Research

- Computer-Integrated Forecasting** 19
We have developed a prototype computer-integrated forecasting system that helps product developers anticipate market trends. [A92C6]
- U. S. Apparel Demand Projections** 20
Our apparel demand forecasting output now has significantly enhanced graphics. [S92C7]
- Modeling Consumer Behavior Globally** 21
Mexican consumer studies show potential new opportunities for U.S. apparel. [A92C7]

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MFA Phaseout Implications	21
We are developing an econometric model of the global textile industry to examine the impact of trade policies. [A93N4]	
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Letter from the Editor

Starting with this quarterly report, we have described the objective and status of each National Textile Center project with only one-half page of text. In addition, we have provided a 1-2 line highlight of each project in the Table of Contents so that you can go quickly to the items that interest you most. This write-up is meant only as a starting point. We encourage you to contact the investigators directly for further information (their phone numbers are on the inside back cover) and consult the references cited. The research work at Auburn, Clemson, Georgia Tech and NC State, the four universities in the NTC research consortium, has resulted in well over 100 technical articles and presentations plus another 30 papers in preparation and over 25 theses completed with several more nearing completion. Over 130 students have been involved in these efforts.

Quarterly Report Organization

So you can more easily find items of interest to you and to facilitate technology transfer, I have organized this report in several different ways:

- **Table of Contents:** Research projects in the consortium cover the gamut from fiber spinning through yarn, fabric and garment manufacture to retail sales. The projects are organized into eight core competencies which are defined in the Table of Contents and in the body of the report.
- **Index by Project Management:** Project summaries are arranged according to which university has the lead management role. For multi-campus projects, the collaborating universities are listed in parentheses after the title.
- **Index by Topic:** This may be the easiest way to find what you're looking for. Notice the large number of projects, spread across the entire fiber-textile-apparel-retail industrial complex, that are using computer and mathematical modeling.
- **Index of Principal Investigators:** Over 100 principal investigators from the four universities are listed as contributors to the research projects and over one-third of them are contributing to more than one project. Also, the back cover lists by university each principal investigator with phone number.

Tom Doherty